ABSTRACT

A water holding layer having a carbon-based material and a water holding material is arranged on an anode diffusion layer. The water holding material is contained at 5 to 20 wt% of total weight of the water holding material and an electron conductive material. Alternatively, carbon particles having water absorption amount at saturated water vapor pressure at 60°C is not less than 150 cc/g are contained in the anode diffusion layer. Water absorption ratio of the anode diffusion layer at 60°C is in a range of 40 to 85%, a differential pressure is in a range of 60 to 120 mmaq, and a ratio of quantity of electric charge of catalytic material of the cathode catalytic layer existing in proton conductive passage from the polymer electrolyte membrane is not less than 15% of the quantity of electric charge of all the catalytic material existing in the cathode catalytic layer. Furthermore, a layer including carbon particles having water absorption amount at saturated water vapor pressure at 60°C of not less than 150 cc/g and fluorine resin, is arranged on a carbon-based material having a contact angle with water of not more than 90° by performing a hydrophilic treatment. The water absorption ratio at 60°C is in a range of 40 to 85 wt%, and the penetration resistance is not more than 5mΩ.